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THESIS

LOGISTICS SUPPORT FOR COMMERCIAL ITEMS AND NON-DEVELOPMENTAL ITEMS CASE STUDY: THE P-3C ANTI-SURFACE WARFARE IMPROVEMENT PROGRAM (AIP)

by

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September 1998

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The technological advances of the last decade have resulted in the commercial market leading the military market in many areas of technological development. As a result, the military depends on the commercial sector for increased capabilities in many systems. The Commercial Item and Non-Developmental Item procurement strategy has been utilized to capitalize on this development. Using pre-existing systems to provide additional capabilities for military weapon systems results in a shorter procurement time and enables new technology to be used sooner. However, the logistics support of these items suffers since there is less time to test and plan for spare parts, training facilities, and support equipment. More assets are needed during the initial planning stages for these items to identify and produce the support structures needed for the life of the system. Finally, the shift of logistics support from an organic, military support system to a commercial support system has certain cost savings that are realized early in the program, but may have long-term effects in terms of security risk and overall life-cycle cost.

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LOGISTICS SUPPORT FOR COMMERCIAL ITEMS AND NON-DEVELOPMENTAL ITEMS CASE STUDY: THE P-3C ANTI-SURFACE WARFARE IMPROVEMENT PROGRAM (AIP)

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ABSTRACT

The technological advances of the last decade have resulted in the commercial market leading the military market in many areas of technological development. As a result, the military depends on the commercial sector for increased capabilities in many systems. The Commercial Item and Non-Developmental Item procurement strategy has been utilized to capitalize on this development. Using pre-existing systems to provide additional capabilities for military weapon systems results in a shorter procurement time and enables new technology to be used sooner. However, the logistics support of these items suffers since there is less time to test and plan for spare parts, training facilities, and support equipment. More assets are needed during the initial planning stages for these items to identify and produce the support structures needed for the life of the system. Finally, the shift of logistics support from an organic, military support system to a commercial support system has certain cost savings that are realized early in the program, but may have long-term effects in terms of security risk and overall life-cycle cost.

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I. INTRODUCTION

A. BACKGROUND

The United States military of the twenty-first century will be faced with many challenges. Perhaps the most formidable task facing today's military leaders will be managing the resources at hand to accomplish the mission that is expected of them. Downsizing the military has been a necessary, but controversial process during the last nine years. Department of Defense (DOD) personnel end strengths have been reduced 46 percent since 1987, and military infrastructure, or the bases, equipment, and facilities necessary to support combat forces, has declined as well (Ref. 21:p. 1). While the threat of nuclear war has diminished, many new threats are identified in President Clinton's National Military Strategy that require the United States to maintain a military presence throughout the world (Ref. 25:p. 1). This change in mission definition and resource availability requires a high level of effectiveness and efficiency at all levels of military operations. “Doing more with less” is a fiscal reality that has reached "commandment" status within the military. One way to accomplish this is to improve the defense acquisition process so that high quality equipment is fielded quickly and efficiently to field commanders and their troops.

Acquisition reform initiatives have been introduced throughout this decade that attempt to attain this goal. One of these reform initiatives is to decrease the emphasis on full-scale development of weapon systems and increase the emphasis

on obtaining pre-existing systems: the Commercial-Items (CI) / Non-Developmental Items (NDI) procurement strategy (CI/NDI). Using pre-existing equipment as an acquisition solution has always been part of the acquisition process. During the early phases of acquisition, an extensive market survey is conducted to see if equipment exists that can meet the specific needs of the military. Once this survey is completed, and no current alternative is found, then a full development program is started. Recent acquisition reform legislation such as the Federal Acquisition Streamlining Act of 1994, and the Federal Acquisition Reform Act of 1996, have increased the emphasis on finding these existing systems, and many new methods to use current systems are being utilized (Ref. 14:p. 4). The use of pre-existing fire-fighting equipment aboard U.S. Naval ships and commercially-available data terminals for U.S. Army missile systems are recent examples of this strategy (Ref. 16:p. 6).

The potential benefits to the Department of Defense from the use of CI and NDI to meet requirements have grown in number during the 1990's, and are the driving force behind the change currently underway in Defense acquisition. The most common benefits are:

- Savings in procurement costs; the economies of scale of a larger commercial market allow items to be sold at lower prices. This in turn reduces the total cost of the system throughout the its useful life.
- Use of existing, previously-developed items, whether commercial or military, saves research and development costs, shortens fielding time, and reduces the risk associated with new development.
- The Department of Defense must buy from the commercial market to access state-of-the-art technology and products since the defense department no longer leads private industry in research, development,

and application. For example, in the fields of communications, electronics, and computers, the pace of technological evolution resulting from high commercial demand outstrips the capabilities of any government research and development (R&D) program. (Ref. 25:p. 4-3)

- Integration of the defense and commercial industrial bases. DOD requirements that are integrated into commercial production are far more likely to have a stable and existing industrial base to draw from if there is a surge in requirements due to an emergency. Additionally, in times of reduced procurement, DOD business is not sufficient to keep many defense-unique suppliers in business. Integrated commercial and defense production is beneficial for the nation's security and economy in the long run. (Ref. 25:p. 4-3)

Buying and using commercial and non-developmental items also presents some challenges and departures from normal acquisition methods. For example, items developed primarily for non-DOD sales may require performance trade-offs to meet DOD needs. Or it may be necessary to modify the item itself, which requires special management to handle the new requirements of the modifications. The challenge this thesis addresses is the logistics support of commercial and non-developmental items. Logistics support refers to a wide range of activities and analyses that are conducted throughout the life-cycle of a system. Examples of these activities are developing strategies for maintenance planning, support equipment, and manpower considerations. Many of these activities are accelerated or abbreviated during a CI/NDI acquisition, which can result in an inadequate support system being implemented for a weapon system once it is manufactured and fielded. (Ref. 25:p. 4-4)

This thesis will look at the three basic levels of systems support for CI/NDI items: full commercial support, full government support, or a

combination of both. Full commercial support allows the civilian company providing the product to support it through its lifetime. Full government support refers to an "organic support concept", or where the government creates a supply and repair infrastructure for the system, and replenishes that infrastructure through the commercial industry. A combination of these two strategies refers to shared responsibility between the government and the contractor to provide specific items, training, and facilities that will ensure the weapon system is fully supported throughout its service life. Each of these must be considered during the acquisition process to ensure the product that is fielded to U.S. military forces will have the spare parts, technical manuals, maintenance and operator training, and eventual disposal support needed to make it an effective addition to the military arsenal.

B. OBJECTIVE

The objective of this thesis is to compare the effectiveness of three different methods of systems support for a procurement program using the CI/NDI strategy. For each method of support, the measure of effectiveness will focus on the integration of spare parts and support equipment into the Naval supply system, the implementation of training plans for operational and maintenance personnel, and the effect of spare parts availability on operational readiness. This will be accomplished by conducting an examination of the support strategies used for equipment purchased for the P-3C Orion Anti-Surface

Warfare (ASUW) Improvement Program (AIP). This program was initiated in 1993 to rapidly increase the P-3C Orion's operational capabilities in the areas of Anti-Surface Warfare (ASUW), Over-the-Horizon Targeting (OTH-T), Command, Control, Communications, Intelligence (C3I), and survivability (Ref. 23:p. 1). The program uses pre-existing systems to integrate new capabilities into the current P-3C Orion platform. The program implements commercial support, government support, and a "hybrid" support, which is a combination of the two. The aim of the study is to find the best strategy for supporting this program and to provide a method for analyzing future CI/NDI strategies.

C. RESEARCH QUESTIONS

1. Primary Research Question

- Is there an ideal method of providing logistic support for Commercial and Non-Developmental Items used in the P-3C AIP Program?

2. Secondary Research Questions

- What are the advantages and disadvantages when using a CI/NDI procurement strategy?
- What are the primary logistic support strategies used by DOD for a CI/NDI procurement strategy?
- What form of logistics support was contracted for at the beginning of the program and what were the advantages and disadvantages of that support strategy?
- What form of logistics support is currently provided for the P-3C Orion AIP program?
- What ways are available to improve the effectiveness of logistic support for CI/NDI programs similar to the P-3C Orion AIP program?

D. SCOPE OF THESIS

The scope of this thesis is limited to the logistics support strategies and alternatives for Naval aviation weapon systems using commercial items and non-developmental items to improve or replace existing systems. The focus will be on the Navy's P-3C Orion AIP program, and the support strategies used to provide logistics support to active duty squadrons using the AIP system.

E. METHODOLOGY

A thorough research of legislation, government reports, and current acquisition regulations concerning the CI/NDI approach will be conducted. Equipment using different logistics support strategies will then be selected. The data on these items will be obtained from the Deputy Program Manager for the P-3C Orion AIP program, Lockheed Martin Electronic Defense Systems, and other military commands involved in the project. Feedback on the effectiveness of the chosen logistics strategy will be determined via interviews with personnel at the training and operational squadrons currently employing the system.

An analysis will then be conducted for each support method to determine the level of integration of spare parts and support equipment into the Naval supply system, the implementation of training plans for operational and maintenance personnel, and the effect of spare parts availability on operational readiness. Finally, conclusions and recommendations will be made outlining the benefits and

drawbacks of each method.

F. ORGANIZATION

This thesis is divided into six chapters. Chapter I provided an introduction. Chapter II will provide an overview of the current acquisition process, a history of acquisition reform, and the CI/NDI strategy. Chapter III will provide an overview of logistics support and its relevance to a CI/NDI strategy, including the advantages and challenges of the CI/NDI strategy. Chapter IV will cover the P-3C Orion AIP program, including its procurement history, support philosophy, current methods of support, and performance to date. Chapter V will be an analysis of different support strategies used for several different types of equipment used in the AIP program. Emphasis will be on the integration of spare parts and support equipment into the Naval supply system, the implementation of training plans for operational and maintenance personnel, and the effect of spare parts availability on operational readiness. Chapter VI will be a summary of all the information presented, as well as conclusions and recommendations.

II. BACKGROUND AND THEORETICAL FRAMEWORK

A. INTRODUCTION

The purpose of this chapter is to provide an overview of the participants and legal framework of the defense acquisition system, the planning system that manages defense acquisition, and how acquisition reform affected the use of commercial items and non-developmental items during the acquisition process.

B. PARTICIPANTS AND LEGAL FRAMEWORK

Defense acquisition centers around a Program Manager (PM) for each respective system being procured. This is usually a military officer trained in acquisition matters, appointed by the defense department whose primary responsibility is the cost-effective and timely procurement of weapon systems for military use. In order to accomplish this, the PM must coordinate all actions between three principal entities: The Executive Branch, the Legislative Branch, and private industry. This coordination creates a "triangle" of reports, legal requirements, and communication that is orchestrated by the program manager and his/her staff. As Figure 1. shows, this coordination and management of a program can be very complex.

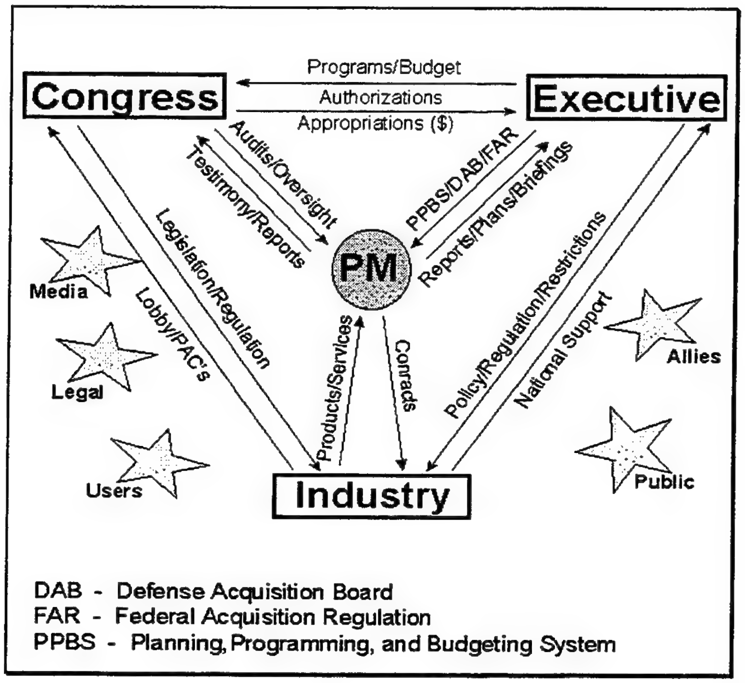

Figure 1. The Program Manager's Environment (Ref. 2: p.6)

The main authority and guidance from the Executive Branch comes from executive orders, the national security strategy, and presidential decision directives (Ref. 2:p. 8). The President, DOD, the Office of Management and Budget (OMB), the Department of State, and the National Security Council are the key members of the Executive Branch that issue guidance on the task of National Security, military roles and missions, and the focus of the National Military Strategy. The Legislative Branch provides the statutory authority that is

the legal foundation for systems acquisition. Congress interacts with the Defense acquisition system through annual authorization and appropriations legislation, numerous acquisition-related laws and regulations. Additionally, there are a number of audit and oversight committees. Private industry provides the products and services needed by the government for defense activities, and includes large and small businesses.

The three most prominent documents that provide legal framework for Defense Acquisition are the OMB Circular A-109, DOD Directive 5000.1, *Defense Acquisition,* and DOD Regulation 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information Systems (MAIS)*. OMB Circular A-109 defines the system acquisition process in terms of needs, capabilities, priorities, and resources, and establishes basic acquisition policy for all federal agencies. (Ref. 2:p. 9)

DOD Directive 5000.1, dated 15 March 1996, is another broad-based document that states the policies and directives for all DOD acquisition programs and identifies the officials and forums that are involved in setting these policies. This is the document that describes and explains the integrated management framework of acquisition, and breaks down the process into three major areas called Decision Support Systems. They are (1) requirements generation, (2) acquisition management, and (3) the Planning, Programming and Budgeting System (PBBS). Each system is designed to be an ongoing processes, continually

updating and attempting to optimize the best strategy to meet the needs of the military. It is a flow of resources and time that depends heavily upon the current military leadership to make decisions on allocating scarce resources to the right area, at the right time.

DOD Regulation 5000.2-R, dated 23 March 1998, is a guideline for mandatory procedures when procuring MDAPs and MAISs, as well as establishing a simple and manageable framework for converting military requirements into procurement programs. This is the document where specific guidelines and regulations are set forth in the acquisition management support system. It is also where OMB Circular A-109 is expanded to provide a single uniform system for planning, designing, developing, procuring, maintaining, and disposing of all equipment, facilities, and services for DOD (Ref. 4:p. 7).

C. THE DEFENSE ACQUISITION SYSTEM

This section provides an overview of the planning process for acquisition management and the procedures and guidelines that are implemented when the military procures goods and services. This will be accomplished by summarizing the three broad areas of requirements generation, acquisition management, and the PPBS. Figure 2 shows how these areas are integrated into a successful program.

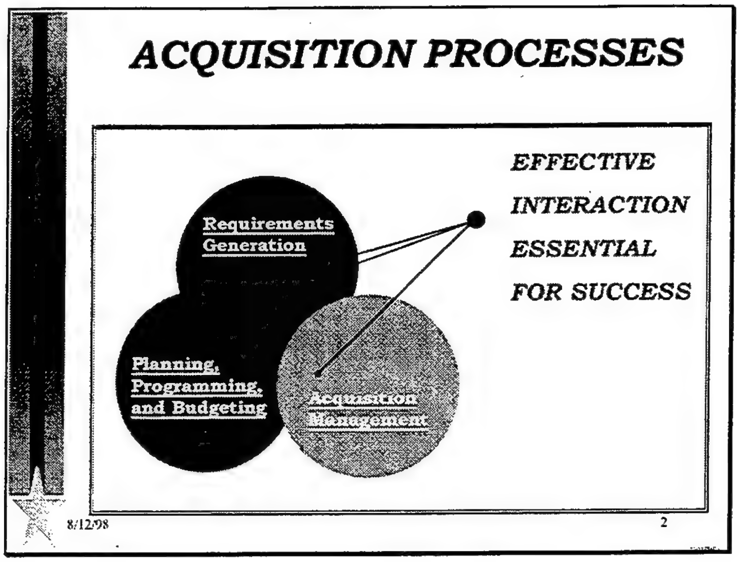

Figure 2. Three Major Support Systems (Ref. 20: p. 3:2)

1. Requirements Generation

When the acquisition process identifies a need for a new hardware system, three necessary documents must be generated. They are the Mission Area Analysis (MAA), the Mission Need Statement (MNS), and the Operational Requirements Document (ORD). Once all non-material solutions are eliminated, non-developmental item acquisition is the first strategy considered. Procuring new equipment can occur for a number of reasons, including:

- replacing an existing system that has become obsolete;
- countering a new threat that has been identified as needing a material solution;
- mission definition within the DOD has changed and a need has been identified for new equipment;
- new technology has been used in existing programs or has caused new systems to develop that can meet a current material need.

(a) Mission Area Analysis (MAA)

The acquisition process begins with a Mission Area Analysis, which is conducted by the Service component. The Service component refers to the military authority within the Army, Air Force, Navy or Marine Corps that is responsible for the acquisition of weapon systems. It is a continuing process that identifies perceived threats, technology changes, and inputs from operational personnel that may indicate a need for modification to existing equipment or development of a new system. This analysis may indicate the Service component has a deficiency or need that requires a military doctrine change or a material solution. If a doctrine change is not the solution, then a material solution is considered. The commercial market is extensively reviewed in a market survey to identify systems that may fulfill the requirements of the perceived need. This is critical in reducing the total cost of procurement in terms of research and development costs, since the commercial market is outpacing military technology in many areas. A graphical representation of this process is shown in Figure 3. (Ref. 1:p. 41)

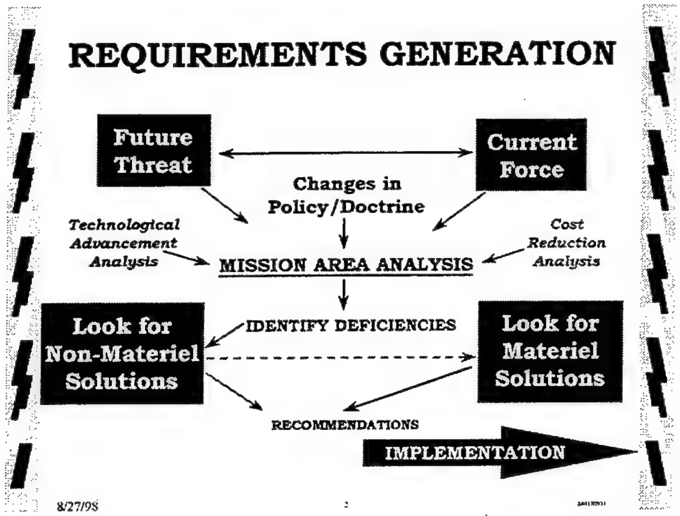

Figure 3. Mission Need Determination (Ref. 20: p. 4:2)

(b) Mission Need Statement (MNS)

The Mission Need Statement is also developed by each Service component and is a product of the MAA. Continual assessment of current and projected capabilities are completed, and comparing them to the National Military Strategy results in a broad statement of need that can be distilled later into a system-specific requirement. The MNS is the document that presents the military need in operational terms and results in an Acquisition Decision Memorandum (ADM) being issued if a material solution is finally accepted. This decision process is depicted in Figure 4. (Ref. 1:p. 42)

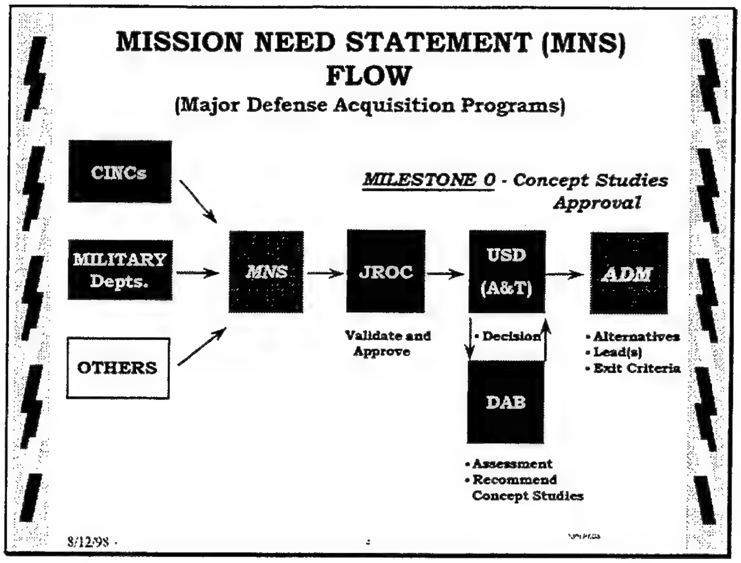

Figure 4. Mission Need Statement Flow (Ref. 20: p.4-2)

Once a MNS is formulated, the Joint Requirements Oversight Council, chaired by the Vice Chairman to the Joint Chiefs of Staff, reviews the MNS to verify the material need, and routes it to the Under Secretary of Defense for Acquisition & Technology (USD (T&A)). A Defense Acquisition Board (DAB) could be assigned by the USD (T&A) to conduct another assessment of the need and recommend possible concepts that could apply to the need. (Ref. 1:p. 43)

Material solutions are classified according to five basic factors: the amount of development risk, the level of urgency in its acquisition, political interests, funding thresholds, and joint program status. Arguably the most important factor is funding, and this is the factor that divides all acquisition programs into five distinct categories, known as Acquisition Categories (ACATs). Each program is assigned a category based on the level of money needed for Research and Development, Test and Evaluation (RDT&E), total procurement

cost, and the level of authority needed for approval. Authority to approve a system is known as Milestone Decision Authority (MDA), and is delegated to the lowest level possible in relation to how much money and resources are being committed to a program. The five different funding levels for ACATs are summarized in Figure 5 below.

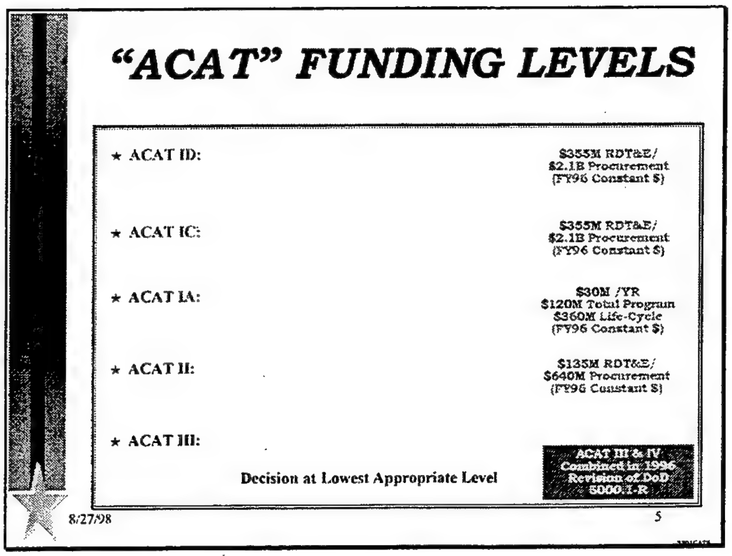

Figure 5. Acquisition Categories (ACATs) (Ref. 20:p. 4-5)

Funding is attained through different "colors" of money, such as procurement appropriations, Research and Development (R&D) appropriations, and Operational and Maintenance (O&M) appropriations. This stratification of money plays a key factor in determining how a program is funded, and the PM must formulate strategies to use each source of funding legally and effectively. An example of this would be to ensure an adequate level of initial spare parts are purchased with procurement funds, instead of using O&M funds.

Finally, the MNS is submitted to the Joint Requirements Oversight Council (JROC). Once this council validates and approves a MNS, it is sent to the Under Secretary of Defense (Acquisition and Technology) (USD(A&T)) whose approval authorizes the program to move to the acquisition management phase.

(c) Operational Requirements Document (ORD)

The Operational Requirements Document (ORD) is where specific objectives and minimum requirements are evolved from the MNS. It is the "raw material" that is utilized in the acquisition management process that produces a weapon system from the MNS, and provides the refinement of the idea of a weapon system into specific material requirements.

2. Acquisition Management

Managing the purchase of a weapon system for the military is divided into periods of time called phases. Each phase ends with the accomplishment of a Milestone decision, or permission to proceed to the next phase. It is an event-driven process that usually spans eight to sixteen years and is very complex, but extremely thorough. The phases and milestones are graphically depicted below. (Ref. 1:p. 45)

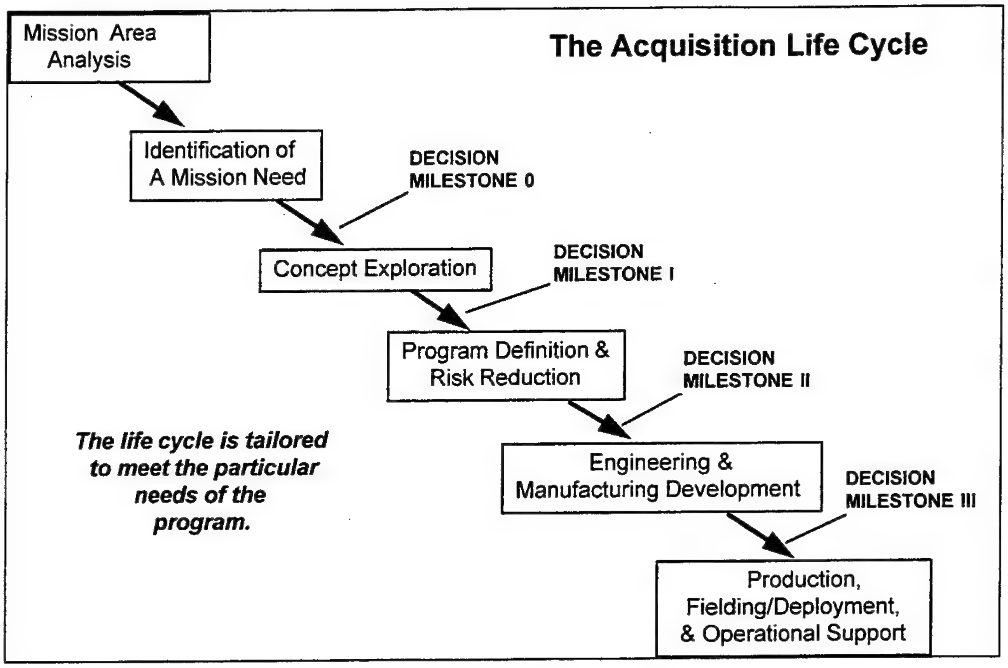

Figure 6. Acquisition Milestones and Phases (Ref. 1: p. 45)

Phases are where action is taken to further define and develop the system in order to meet all the requirements that are put forth in the ORD. Milestones are where a series of questions are asked and answered in terms of seven basic program considerations:

- comparison to established baselines for cost, schedule, and performance;
- analyzing program performance with respect to time, versus planned completion dates;
- program definition compared to the original design;
- what level of planning is enough to establish exit criteria;
- what risk level is there in terms of cost, schedule, and performance.

When a program reaches milestone 0, the designated Milestone Decision Authority (MDA) grants approval to conduct concept studies. These studies begin to outline exactly what type of material solution will be used to meet the needs stated in the Mission Needs Statement (MNS), and will provide the

precursor to the ORD. The MDA will then determine the lead organization, a minimum set of alternatives to be examined, and exit criteria from Concept Exploration (CE), or Phase 0. Many short-term, parallel and competitive studies are conducted to find out if better alternatives could be used, and what the merits of the concept are. Phase 0 usually lasts 1 to 3 years and is generally low-cost. Milestone I grants authority to begin a new acquisition program, and approves the acquisition strategy and concept baseline. Also, exit criteria for Phase I and Cost as an Independent Variable (CAIV) objectives are established. (Ref. 1:p. 48)

The program reaches Milestone II, approval to enter Engineering, Manufacturing, and Development (EMD), once all Phase I criteria are met. This point is where developmental baselines are established, which refines the concept baseline into cost, schedule and performance objectives to be met. An initial production base is now established by identifying items for Low-Rate Initial Production (LRIP). This is a good tool that is used to measure the logistical support system before full-rate production is reached. Phase II is reached once Milestone II is completed, which is where full development, engineering , design, and manufacture of the system is achieved. A test and evaluation system is established to demonstrate all the manufacturing and production processes involved. The objective of Phase II is to establish a production and support base, and demonstrate that the weapon system has the operational capability to satisfy the mission need. Once the system is fielded, modifications may be needed. (Ref. 1:p. 50)

3. Resource Allocation Process (RAP)

Resources for acquisition are the same as for most other endeavors: money, personnel, and material. Resource allocation refers to the 4 phases of Planning, Programming and Budgeting (PPBS), Enactment, Apportionment, and Execution. The PPBS is the official management system used by the Department of Defense which formulates the spending strategy for funds approved for DOD in the President's budget submission. It is a formal, systematic structure that facilitates decision-making in allocating scarce resources to all the Services. The ultimate objective is to provide the best mix of forces in view of real fiscal restraints. (Ref. 1:p. 51)

Enactment refers to a congressional review of the President's budget, and the subsequent hearings and debates over expenditures. This phase ends when the President signs the authorization and appropriation bills generated by Congress. Apportionment occurs when the Office of Management and Budget provides the funds specified in the Enactment Phase to DOD and the rest of the Federal Government. Execution refers to the actual expenditure of the funds on defense programs. Figure 7 shows the relationships between these phases. (Ref. 1:p. 52)

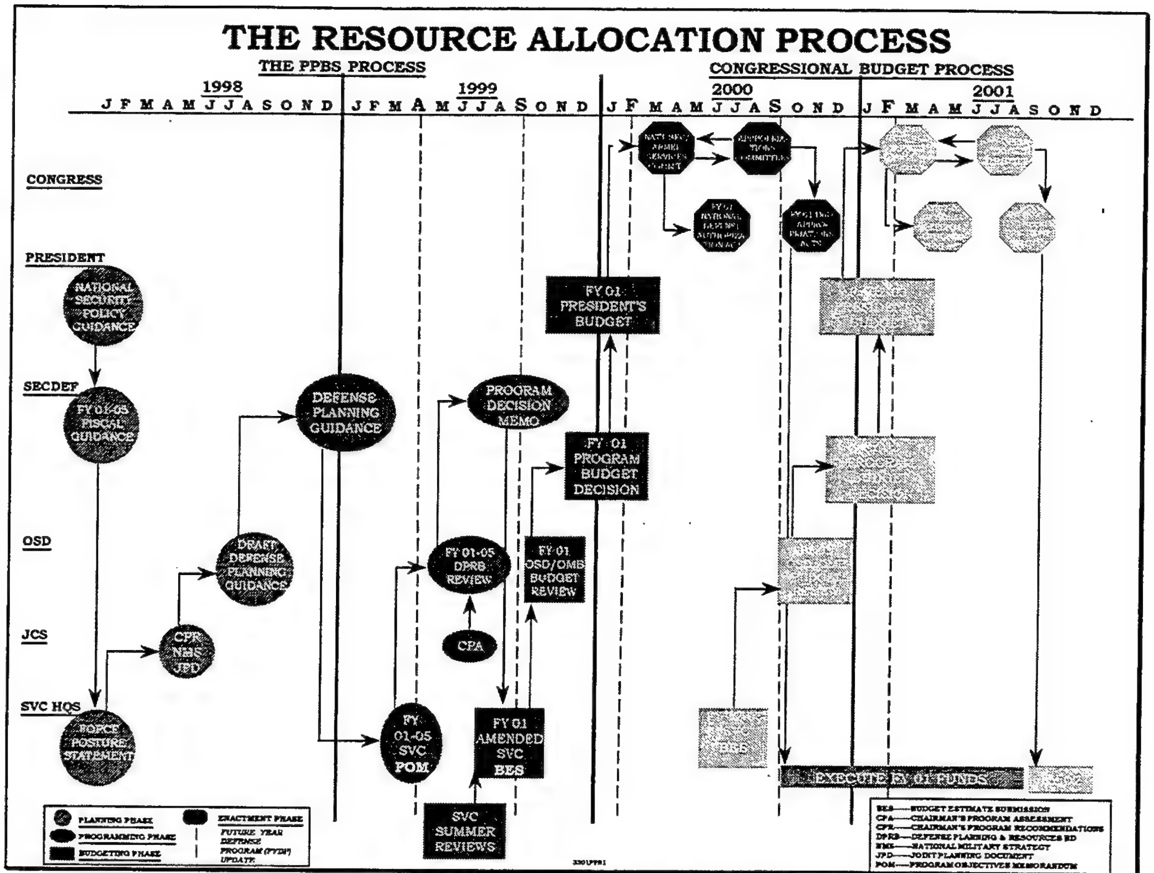

Figure 7. Resource Allocation Process (Ref. 20: p. 4-7)

This overview is presented here to demonstrate that the established system of procurement is complex, and time-consuming. It is not intended for the reader to gain a full knowledge into the entire PPBS timeline. Although this method is very complex, it is extremely thorough and examines every possible aspect of procurement to identify the best possible combination of operational need and available resources. As the next sections reveal, the recent changes in technology, politics, and culture have changed the way this process is viewed by DOD, and a shift in focus has resulted in an organization looking for a better way to capitalize on many new methods of acquisition.

D. ACQUISITION REFORM

This section will discuss the history of acquisition reform in the Department of Defense and the increased emphasis on Commercial Items (CI).

1. History of Reform

Reform in the Acquisition community has been a elaborate and somewhat frustrating process that has had several attempts and restarts. A 1992 GAO Report states that reform can be traced as far back as 1794 when cost overruns and schedule delays in the Navy resulted in delivery of only 3 of 6 Frigates ordered (Ref. 9:p. 18). This section will provide an overview of some reform efforts of the recent past, and outline the changes made in recent years.

Acquisition reform is not a new concept. In 1947, the same year as the establishment of the Department of Defense (DOD) , the Hoover Commission was tasked with reviewing the Executive Branch of government and making recommendations as to how it might be better managed and organized. The commission's Eberstadt task force on the National Security Organization concluded that the new organization "neither worked well nor yielded maximum security for the defense dollar." Additionally, it noted that intense inter-service rivalry "hampered and confused" policy. The task force recommended that greater authority be granted to the Secretary of Defense, and that the military budget system be overhauled. (Ref. 10:p. 59)

In the early 1960's, Robert S. McNamara was appointed as Secretary of Defense (SECDEF) and his attempt to grapple with the "Military Industrial Complex" legacy of World War II led to establishment of many of the procedures and regulations that are still used today. The Future Years Defense Program (FYDP), formerly known as the Five Year Defense Program, and the Planning Programming and Budgeting System (PBBS) find their origins during this period. Debatably, McNamara's strategies actually succeeded in fielding effective weapon systems, but at the cost of efficiency, since the process was refined into a complex maze of requirements and rules. In 1972, the Commission on Government Procurement acknowledged the need for a philosophical shift in the government's acquisition policies. The focus of the shift was intended to be away from the developmental items and towards the commercial marketplace. (Ref. 5:p. 1-1)

The beginning of the modern acquisition reform movement can be traced back to President Reagan's 1986 Blue Ribbon Commission on Defense Management. Known as the Packard Commission, it was assigned the duty to "evaluate the defense acquisition system, to determine how it might be improved, and to recommend changes." (Ref. 7:p. 41). Defense Secretary William J. Perry assembled an Acquisition Task Force (ATF) to find solutions to the problems noted by the commission, which led to the adoption of the Total Quality Management concept proven by Edward Deming in Japan during the 1950s and 1960s. The ATF identified six features of successful companies that could be

applied to defense acquisition. Then it derived nine steps by which the DOD could try to emulate these companies. (Ref. 7:p. 50)

- streamline acquisition organization procedures
- use technology to reduce cost
- balance cost and performance
- stabilize programs
- expand the use of commercial products
- increase the use of competition
- clarify the need for technical data rights
- enhance the quality of acquisition personnel
- improve the capability for industrial mobilization

In 1989, Secretary of Defense Dick Cheney created the Defense Management Review (DMR) in response to the Packard Commission's findings. This review focused on a "pragmatic workable set of recommended changes" to the acquisition laws, and resulted in the formulation of the Section 800 panel, an Executive-Legislative branch partnership created to streamline the legal requirements for DOD acquisition. After 16 months of effort, the panel submitted an 1,800 page report reviewing over 600 statutes, and making recommendations as to whether they should be repealed, retained, amended, or sustained (Ref. 7:p. 33)

The House Armed Services Committee also conducted an extensive review of the personnel involved in acquisition and focused on four major questions:

1. Are the Services appointing program managers, deputy program managers, and contracting officers with the experience, education, and training required by law and regulation, and are program managers being retained in their

positions the mandatory four years or completion of a major milestone?

2. Is there a career program structure to develop qualified and professional acquisition personnel, both military and civilian?
3. Is there an appropriate mix of military and civilian personnel within the workforce?
4. What impediments exist that must be overcome in order to develop a quality, professional workforce ? (Ref. 7:p. 2)

The assessment determined that many deficiencies were present in the education and training of acquisition personnel and in 1990 Congress passed the Defense Acquisition Workforce Improvement Act (DAWIA) in order to "improve the effectiveness of the military and acquisition workforce through formalized training and career development. (Ref. 7:p. 2)

2. Modern Day Reform Efforts

On March 3, 1993, the National Performance Review (NPR) was issued as guidance to make the government more efficient. Based on the original report *"From Red Tape to Results: Creating a Government that works better and costs less"* by Vice President Al Gore, this document made several recommendations for acquisition reform, and anticipated a government savings of $108 billion. (Ref. 11:p. 1) The most dramatic changes in defense acquisition came from two primary documents: the 1994 Federal Acquisition Streamlining Act (FASA) and the 1996 Federal Acquisition Reform Act (FARA). FASA granted authority to conduct pilot programs, emphasized using COTS items, established the Federal Acquisition Computer Network (FACNET), and reduced requirements for Cost and Pricing Data (Ref. 12:p. 3). FARA continued to reduce requirements and

regulations by streamlining competition requirements, repealing legislation that inhibited Information Technology (IT) acquisition, and giving contracting officers more flexibility in terms of limiting competition. This legislation proved that the Congress was committed to reform.

The Department of Defense did a complete review of the DOD 5000 series regulations and published new regulations in 1996. This is the origin of the six themes of acquisition reform that are in force today. The first theme, teamwork, optimizes overall performance. Using Integrated Product Teams (IPTs) early in the acquisition process does this. The second theme, tailoring, grants the Milestone Decision Authority (MDA) flexibility in applying sound business practices in accomplishing tasks in an expedient and effective manner. The third theme is empowerment, which balances responsibility with authority. In essence, it allows the program manager to be very flexible early in the procurement process, since timeliness is a key factor affecting the cost of a program. The fourth theme is Cost as an Independent Variable (CAIV). It forces trade-offs between cost, schedule, and performance in order to achieve the best value. The fifth theme is greater use of commercial products, which recognizes the shift of industry within the United States from government-based consumption to worldwide consumption. This attempts to fight the obsolescence battle that happens during the normal acquisition process. The final theme, best practices, refers to using the most effective means available to get the job done. (Ref. 13:p. 2)

E. CI/NDI ACQUISITION

This section defines commercial items and non-developmental items and also provides an overview of the acquisition of these items. A Commercial Item (CI) is any item evolving from or available in the commercial marketplace that will be available in time to satisfy the user requirement. They are any combination of items customarily combined and sold to the general public. Services (installation, maintenance, training, and other) for these items may be procured for federal government use. These services are offered and sold competitively, in substantial quantities, and are available in the commercial marketplace. (Ref. 14:p. 1)

A NDI Item (NDI) is one that was previously-developed and used exclusively for governmental purposes by a Federal Agency, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement. NDI can require minor modification in order to meet the requirements of the agency. Items that are developed and will soon be used by the Federal, a State or Local government, or a foreign government are also considered NDI. (Ref. 14:p. 1)

Acquisition management identifies CIs and NDIs early in the requirements phase of procurement, and continually seeks opportunities to use them as a project unfolds. A decision process for this is summarized on the following page in Figure 8. (Ref. 14:p. 1)

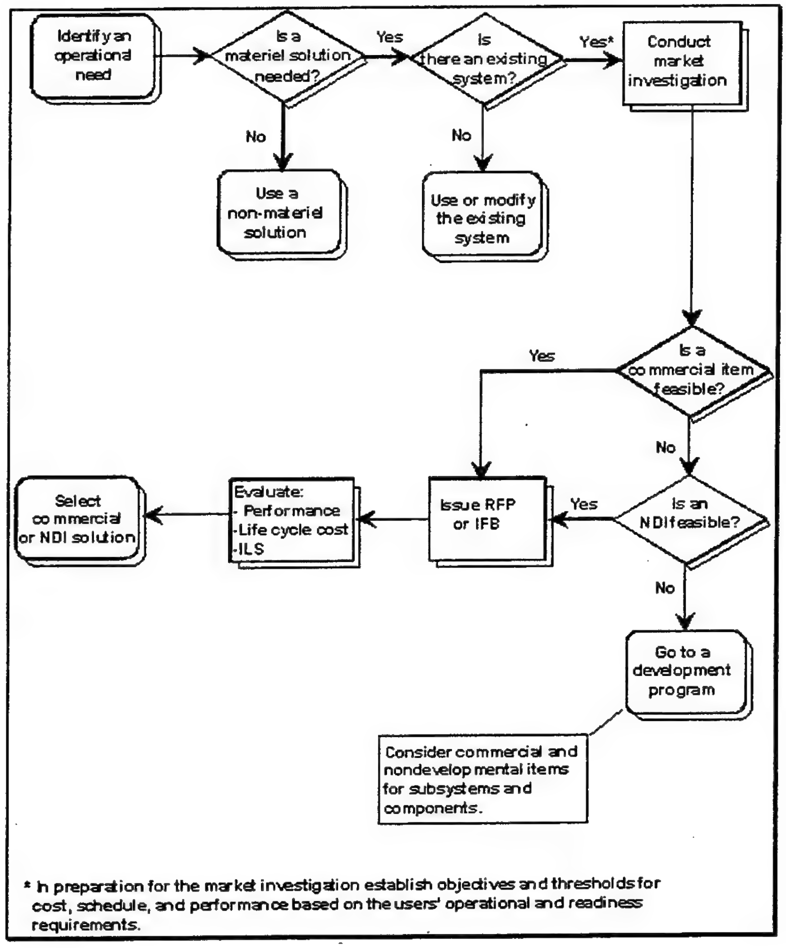

Figure 8. CI/NDI Decision Process (Ref. 14:p. 1)

Procurement guidelines are developed during the normal process, but there is increasing emphasis on utilizing existing sources to solve any developmental problem that arises. This strategy results in a system that meets all the needs of the original Mission Needs Statement (MNS), but is fielded with reduced costs and in a shorter time. A general strategy when selecting pre-existing equipment is to ruggedize it for the specific task it is being mated to, militarize and integrate it

with the other systems needed, and their requisite support structure, and follow the normal acquisition guidelines to final development. This concept is demonstrated in Figure 9.

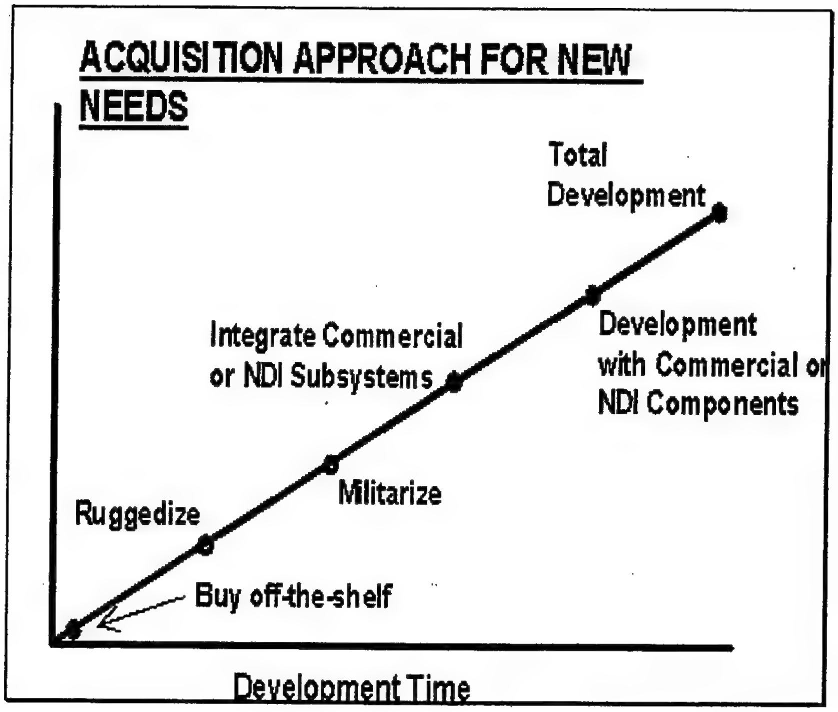

Figure 9. Acquisition Approach for New Needs (Ref. 14:p. 4)

While the use of pre-existing systems seems to be a good idea and is being implemented throughout the Department of Defense, a list of benefits and drawbacks are needed to keep the strategy in perspective.

1. Advantages

The potential Department of Defense(DOD) benefits from the use of CIs and NDIs to meet requirements have grown in number and significance over the last two decades as the defense environment has changed. Use of previously-

developed items, whether commercial or military, saves research and development costs, shortens fielding time, and reduces the risk associated with new development. First, the DOD must buy from the commercial market to access state-of-the-art technology and products. In many of the technological areas significant for defense items, the DOD no longer leads private industry in research, development, and application. For example, in the fields of communications, electronics, and computers, the pace of technological evolution resulting from high commercial demand outstrips the capabilities of any government Research and Development (R&D) program. (Ref. 14:p. 9)

A second important benefit from the use of commercial items is the integration of the defense and commercial industrial bases. DOD requirements that are integrated into commercial production are far more likely to have a stable and existing industrial base to draw from if there is a surge in requirements due to an emergency. Additionally, in times of reduced procurement, DOD business is not sufficient to keep many defense-unique suppliers in business. Integrated commercial and defense production is beneficial for the nation's security and economy in the long run. To summarize, the main benefits for using CI/NDI are: lower life-cycle cost, more rapid deployment, proven capability, and increased competition. (Ref. 14:p. 11)

2. Disadvantages

Buying and using commercial and NDI items also present some challenges and departures from full developmental acquisition. For example, items developed primarily for non-DOD sales may require performance trade-offs to meet DOD needs; or it may be necessary to modify the item itself, which requires special management to handle the ramifications of the modifications. The lead-time from concept exploration to full-scale production is also a disadvantage to planning and implementing a logistics support plan. Logistics support activities normally accomplished in pre-production phases of a development program, often have to be accelerated for acquisitions with more immediate delivery. Using Contractor Logistics Support (CLS) or relying on commercial product support systems are frequently the best solutions. Defense logistics support systems may have to be replaced or at least supplemented by CLS. (Ref. 14:p. 18)

F. SUMMARY

This chapter has provided a basic framework and background on the Defense Acquisition System by providing an overview of the main participants and the legal framework surrounding acquisition. The Defense Acquisition System was explained, and a history of the acquisition reform was presented. Finally, CI/NDI procurement was summarized, and some of the benefits and challenges from using this strategy were presented. The next chapter will discuss the logistics challenges of using CI/NDI.

III. COTS/NDI LOGISTICS SUPPORT REQUIREMENTS

A. INTRODUCTION

> Logistics is the fastest moving train around. The Navy Logistics focus is changing from a stovepipe support concept to a barrier-free environment (Ref. 15)

This quote from RADM Raymond A. Archer III, Commander, Naval Inventory Control Point (NAVICP), conveys the sense of rapid change that is occurring as the Navy continues to streamline and shift from a self-contained logistics support system to a more flexible but more uncertain commercial-dependent support. In this fast-paced environment, it will very important for today's Program Managers to focus on the challenges of CI/NDI support, principally training and logistics support. This chapter will focus on logistics support of CI/NDI projects and provide the background and analysis necessary to understand how weapon systems are supported once they are purchased by the military. First, an overview of the Acquisition Logistics Support Process and its relevance to CI/NDI acquisition will be presented. Then, a discussion of several logistical support strategies used for CI/NDI items will be presented followed by a summary.

B. ACQUISITION LOGISTICS

Acquisition logistics was formerly known as the Integrated Logistics Support (ILS) concept. The acquisition logistic support process is the method by which the program manager of a weapon system attempts to reduce the cost of weapon system

support by integrating and analyzing all logistic support factors into the equipment design process system as soon as possible. The cost of systems modification to enhance logistics supportability increases dramatically as a project proceeds through the phases of design, manufacture, and support. Therefore, integration of logistics support considerations early on in the acquisition cycle is critical to success. (Ref. 20:p. 2) Acquisition personnel use two main components of planning and research to integrate logistics into a weapon system: Logistics Management Information (LMI) and Support Analyses Summaries (SAS). These concepts are further explored below.

1. Logistics Management Information

Generating the information and infrastructure necessary to support a project is organized into the Logistics Management Information (LMI) system and Supportability Analysis Summaries (SAS). LMI was previously known as the Logistics Support Analysis (LSA) process. The products of this process are Supportability Analysis Summaries (SAS). The format of SASs are contained in DOD document MIL-PRF-49506, and coincide with the Support Element (SE) concept of logistics management. LMI and SASs describe information required by the government to perform acquisition logistics management functions. It is intended to replace the old Logistics Support Analysis Record (LSAR), and is also a fundamental change in the way data requirements are levied in contracts. The principle focus is on providing the DOD with a contractual method for acquiring support and support-related engineering and logistics data from contractors. The DOD uses this data in-house in existing DOD materiel management processes such as those for initial provisioning, cataloging, and item management. (Ref. 25:p. 4-14)

2. Supportability Analysis Summaries (SAS)

These are packages of data that the DOD logistics managers use to conduct logistics planning and analysis, influence program decisions, assess design status, and verify contractor performance. SASs are not all inclusive or exclusive and are intentionally described in general terms to encourage maximum contractor flexibility. The content of the summaries is not limited to information and data products cited in the LMI specification. They can be delivered as stand-alone reports or as an integral part of other systems engineering documentation. The contract between the government and the commercial producer will specify the specific content of each summary. (Ref. 42:p. 1)

(a) Maintenance Planning

These summaries provide maintenance planning information to the government that may be used to develop initial fielding plans for the support structure of the finished product. These summaries may also be used to verify that the maintenance actions and support structure are aligned with the government's requirements and maintenance concept. The information contained within these summaries is associated with repairable items to the level of detail specified in the contract. It identifies all preventive and corrective maintenance actions along with the required spares and support equipment. These summaries also provide supporting information justifying the need for each maintenance action, e.g., elapsed time of maintenance actions; task frequency; failure rate of an item; Mean Time To Repair an item; and an item's man-hour allocation by maintenance action and level. (Ref. 42:p. 1)

(b) Repair Analysis

These summaries provide the program manager with conclusions and recommendations of the maintenance repair analysis. They are also used to develop initial fielding plans for the end item's support structure. The conclusions may include a listing of which items should be repaired and which should be discarded. These summaries may identify the level of maintenance at which items should be repaired, and associated costs. They also identify for the system support structure, the operational readiness achieved, and the placement and allocation of spares, support equipment, and personnel. (Ref. 42:p. 1)

(c) Support and Test Equipment

These summaries provide data necessary to register, or verify the registry of, the support or test equipment in the government's inventory. They may provide details of the Test Measurement and Diagnostic Equipment (TMDE) calibration procedures, technical parameters, and any piece of support equipment needed to support the required support equipment. (Ref. 42:p. 1)

(d) Supply Support

These summaries provide the government with information on static and application related hardware information which may be used to determine initial requirements and cataloging of support items to be procured through the provisioning process. They may include the identification of the system breakdown, maintenance coding, maintenance replacement factors, overhaul rates, roll-up quantities, design change information, and associated technical manuals, as applicable. (Ref. 42:p. 1)

(e) Manpower, Personnel, and Training

These summaries provide information to the government so it can establish training plans and ensure manpower and personnel constraints are met. The information contained within this report should identify items' corrective and preventive maintenance tasks, operations tasks, manpower estimates for each task by maintenance level, personnel skills required to perform the maintenance tasks, and any training required to allow these tasks to be performed. (Ref. 42:p. 2)

(f) Facilities

These summaries identify the facilities required to maintain, operate, train personnel for, and test an item. The facilities may be organizational, intermediate, or depot maintenance facilities, training facilities, or mobile and test facilities. This helps plan for any modification to an existing facility or development of a new facility. (Ref. 42:p. 2)

(g) Packaging, Handling, Storage, and Transportation.

These summaries identify packaging, handling, and storage requirements. This information helps in the development of a transportability analysis report. All information within this summary is associated with repairable items to the level of detail specified on contract. (Ref. 42:p. 2)

(h) Post Production Support

The purpose of these summaries is to analyze life cycle support requirements of the new system, equipment, or software prior to closing of production lines to ensure sufficient resources are secured for the system's remaining life. They

identify support items associated with the system that will present potential problems due to inadequate sources of supply, support capability, or modification after shutdown of production lines. They also identify alternative solutions for anticipated support difficulties during the remaining life of the system. General topics that may also be addressed in these summaries are manufacturing, repair centers, data modifications, supply management, configuration management, and other related areas. (Ref. 42:p. 2)

C. LOGISTICS CONSIDERATIONS DURING CI/NDI ACQUISITION

In the previous chapter, it was noted that the decision to use CI or NDI is made at the very beginning of an acquisition project. If CI or NDI is appropriate for the operational need specified in the Mission Needs Statement (MNS), market investigations are initiated to identify available products. Once items are identified, an analysis of the existing logistics data is conducted to:

- assess standardization issues;
- compare to similar systems;
- determine and evaluate any support alternatives;
- determine the impact CI/NDI introduction will have on existing fleet support;
- assess sources of support once production ceases.

Following this analysis, the CI/NDI decision is made, and the process to obtain logistics products (spare parts, repair facilities, support equipment, etc.) to support the system begins. The logistics considerations for a project are addressed at the start of any procurement by a systems engineering approach. Systems engineering is a set of inter-related analysis efforts whose end product is translating the operational needs expressed by the customer, in this case the Department of Defense, into a system design that meets performance, cost, and schedule requirements (Ref. 25:p 4-12). Put simply, it is a

process that systematically eliminates conflicts in the acquisition effort, and integrates hardware, software, and logistics resources (spare parts, repair facilities, transportation systems, etc.) into a finished weapon system or product the military can use efficiently and effectively. Functional analysis, requirements analysis, and systems analysis are the three "cornerstones" of system engineering. Their interrelationships are shown in Figure 10 below.

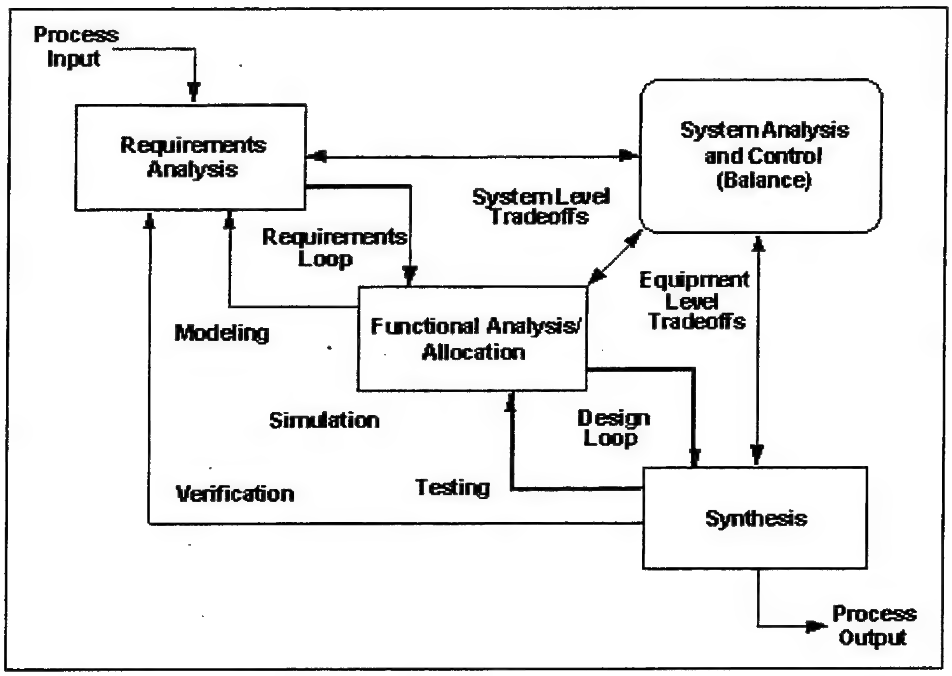

Figure 10. Systems Engineering Process Flow (Ref. 25:p. 4-13)

Each area of analysis, is in essence, a detailed series of "what if " questions designed to ensure the weapon system meets the criteria set by the customer. For CI/NDI projects, the design of the product has already been completed, thus the systems engineering effort focuses on the acquisition logistics discipline. Acquisition logistics (formerly Integrated Logistics Support (ILS)) determines the best set of planned logistics resources for a given system. The main focus of acquisition logistics is to ensure a high

degree of supportability of the system once it is fielded and used within DOD. This is accomplished by analyzing a number of support issues for the project, and eliminating conflicts by considering the effect each has on the overall system. Specifically, supportability analysis evaluates existing support structures in conjunction with force/fleet analysis, threat analysis, and doctrine development (Ref. 25:p. 4-10). Acquisition logistics is conducted through each phase of a project's acquisition. Usually phases are usually combined in a CI/NDI project, and it is not unusual to have a Milestone III decision made to produce, field and deploy a system within two to three years of the initial MNS. (Ref. 14:p. 1)

D. LOGISTICAL SUPPORT STRATEGIES FOR CI/NDI

There is a great deal of uncertainty in the area of logistical support for a CI/NDI acquisition. Most items that are commercially-available have only limited after-purchase support, which is not acceptable for military items that will be in the inventory for many years. Component substitution in production processes, and other factors result in logistics support that lasts only 2 to 5 years. Therefore, it is critical for logistics planners to conduct a thorough analysis of each type of support strategy before proceeding with operational development and testing. This section will deal with the various strategies considered for supporting a CI/NDI item of project. The current environment of logistics support for commercial items will be explained, followed by an analysis of the benefits and challenges of several support strategies.

Several efforts have been underway to identify some of these uncertainties in order to allow military operators to operate and maintain their equipment for entire

service life of the item. Areas of focus were:

- Maintenance Support
- Warranties and data rights
- Configuration management
- Documentation
- Parts provisioning.

Some strategies used to combat these problems were: spare parts and technical data buyouts, escrow for technical data needed for Government use following the end of commercial support, and emphasizing system life-cycle and commercial logistics support availability. (Ref. 18:p. 4)

In general, there are four basic methods being used to provide logistic support for a CI/NDI item. First, there is no support, where enough spares are bought up-front to last the life-cycle of the system. Second, full contractor support is considered where commercial entities have full responsibility to repair and replace items. Third is organic support, where the government supplies all resources needed to repair and replace all aspects of the system. Fourth, is a combination of both contractor and organic support, where responsibilities are delineated for both parties. Each method will be discussed below in terms of advantages and disadvantages.

1. No Support (NS)

This method works by simply replacing failed parts or systems with previously purchased spares. These items are usually known as a "non-repairable item" (NRI) and choosing this support method implies that it is simply cheaper to replace the item than to return it to a serviceable condition. NRIs are usually composed of components that are low cost, which can justify disposal once failure occurs. (Ref. 4:p. 32)

(a) Advantages

There is minimal logistics support for this strategy. No lower-level spare parts are needed, since each item is treated as a whole unit instead of multiple components. Maintenance test equipment costs are also less, since only initial system check-out and ready-for-use certification is needed. Maintenance design is minimal, since no test ports, plug in assemblies, or internal accessibility is needed. Personnel training costs are lowered since minimal maintenance skills are needed for a remove-and-replace maintenance action. (Ref. 4:p. 33)

(b) Disadvantages

Having no support structure means having a higher inventory level than for a repairable item. This would mean higher inventory costs if the government purchases all the spares for a system. Also, this method does not work well with items that have a long service life. There is no provision for any modifications, and no ability to integrate new technology into the system.

2. Total Contractor Support (TCS)

This method involves establishing contractual responsibility for all system maintenance with a commercial contractor. Items needing repair are sent to a commercial source responsible for repairing the item and returning it to serviceable condition. This support can be used most effectively in a non-combat environment, since cycle time for deployed units in wartime can be prohibitively long. Combat effectiveness is also an issue with this strategy, since there is dependence on outside sources to maintain equipment directly involved in combat. (Ref. 4:p. 34)

(a) Advantages

Government risk management for repairable items is reduced when this method is used. Tools and test equipment costs are lowered since there is no support structure owned by the government. Maintenance personnel and training costs are also lowered as a result of the smaller infrastructure. (Ref. 4:p. 35)

(b) Disadvantages

Total dependency on commercial sources for system supportability means additional risk in excessive maintenance costs if MTBF goes down. In other words, if failure rates on equipment begin to rise, unanticipated maintenance cost will rise due to the increased demand for contractor support. Also, quality control could become an issue as time increases, since the government has less control in the management of maintenance practices. Untimely and inadequate support could result with untrustworthy contractors, which will in turn affect combat effectiveness, if not well planned for. Also, incompatibility can become an issue, as commercial maintenance practices change due to technological advancements, personnel rotations, and other factors. (Ref. 4:p. 35)

3. Organic Support (OS)

This method implies that the military organization purchasing the system has all the maintenance skills, equipment, personnel and system-specific resources to provide their own support system. This has been the way that the DOD has usually provided logistics support in the past:

> Traditional logistics presupposes that organic support is the mandatory option. Again, this may be true for some systems and generally can be accomplished for all systems if cost is not a consideration. But efficient

> and effective support depends on their ability to influence system design and parts selection. Otherwise, we accept the risk of costly sole-source parts supply, including maintenance manuals, testing equipment, and technical data. We also risk a system design freeze to a baseline with additional costs to maintain the production base. (Ref. 24:p. 46)

Organic support is organized into three levels of maintenance: Organizational (O-level), intermediate (I-level), and depot. Personnel who actually use the equipment perform organizational maintenance. The maintenance departments in U.S. Navy aircraft squadrons are a good example of this type of maintenance. Usually, maintenance is limited to equipment performance checks, external adjustments, and remove-and-replace maintenance actions. In terms of system knowledge, O-level maintenance requires the lowest level of education and skills. (Ref. 4:p. 36)

Mobile, semi-mobile, and/or specialized organizations and installations perform intermediate maintenance. Tasks for I-level maintenance usually include more sophisticated trouble-shooting using test and support equipment, removal and replacement of major assemblies, and making repairs to modular equipment that O-level maintenance personnel are not qualified to perform. These tasks are generally more detailed and involved than operational level maintenance. The Aviation Intermediate Maintenance Department (AIMD) on board an aircraft carrier is an example of this level of maintenance. (Ref. 4:p. 37)

Depot maintenance is where all other maintenance tasks that are too complex for the I-level and O-level are accomplished. This level usually involves specialized facilities that handle a large number of spare parts, and complete weapon systems, such as tanks, aircraft, and watercraft. Depot level maintenance is where complete overhaul, rebuild, and calibration of equipment occurs. (Ref. 4:p. 37)

(a) Advantages

Organic Support (OS) contains the infrastructure needed to support systems that have high failure rates and large populations (Ref. 24:p. 45) large inventory capability, extensive repair capability, and a self-contained transportation system enable OS to support the high maintenance demand of these systems. OS also is better suited to combat environments, since repair facilities and infrastructure are carried close to the battlefield in times of war. OS infrastructure could also be utilized to help develop new support structures for future systems. (Ref. 4:p. 38)

(b) Disadvantages

One main disadvantage of OS is that risk management of system failure becomes solely the responsibility of the government. This means that future support or analysis of system performance must be completed by government sources, since there is no incentive for original manufacturers to provide resources to improve or support a product that is already paid for. The analogy of a warranty on a computer bought by an individual demonstrates this concept. Once the warranty expires, any system failure and subsequent repair expense must be borne by the customer. Therefore, failure rates may be engineered to coincide with the expiration date of the warranty. Another disadvantage is that technical data, unless specified under the purchasing contract, may be needed at a later date to develop a logistical support structure. Systems using OS also should be repairable, and have some salvage value. With many CI/NDI systems, the short acquisition cycle-time usually precludes the development of a fully-organic support structure. (Ref. 24:p. 45)

4. Organic Contractor Mix (Hybrid Support)

This method involves sharing maintenance responsibilities and system failure risk between both the contractor and the government. In this arrangement, the government usually assumes the organizational maintenance tasks, while the contractor provides the depot level tasks. (Ref. 4:p. 39)

(a) Advantages

Some of the characteristics of systems that use this method would be those that do not fall into the non-repairable category, are not suited for total contractor support, and have long service lives, as opposed to technology-insertion systems.

(b) Disadvantages

It may be difficult to control the transition from one method to another. Any misunderstanding or misinterpretation of contract stipulations could result in a loss of support, especially critical in wartime. These misunderstanding also could cause delays in all phases of acquisition.

E. SUMMARY

This chapter has provided background and analysis on the logistic support issues faced by military planners when purchasing CI/NDI items. An overview of the Acquisition Logistics process was presented, and several support strategies for CI/NDI procurements were discussed. The next chapter will provide a case study on a logistics support strategy currently in use.

IV. P-3C ORION CASE STUDY

In order to analyze the different support strategies involved in CI/NDI procurement, a case study will be used to demonstrate the benefits and shortcomings of a chosen strategy. This chapter will provide a background of the P-3C Orion and the AIP program. Then, an analysis of several support strategies used for the equipment purchased in this program will be presented. Finally, a summary of the information analyzed will be provided.

A. BACKGROUND

This section will present a brief history of the procurement of the P-3 Orion, an overview of the Anti-Surface Warfare Improvement Program (AIP), and the current status of the program.

1. P-3 Procurement History

The P-3 was developed to replace both the land-based Lockheed P2V Neptune and the Martin P5M Marlin as the Navy's principal maritime patrol aircraft. It is based on the Lockheed Electra airliner that has been in production since 1957. The first P-3 aerodynamic prototype flight occurred on August 19, 1958. The first operational P-3A deployed in August 1962 and was designed to provide long loitering capabilities over high cruise speeds in order to perform its' Anti-Submarine Warfare (ASW) and maritime patrol missions. The P-3 Orion was manufactured in three model types; the P-3A, B, and C. (Ref. 26:p 2)

Lockheed enjoyed the benefits of being the sole-source provider of this aircraft until November 1985 when the Navy, hoping to reduce costs, decided to try to acquire an improved P-3C, called the P-3G, on an open competition basis. The goal was to obtain 125 aircraft to replace the large number of P-3As and P-3Bs reaching the end of their service lives between 1992 and 1997. Besides replacing the aging aircraft, three specific reasons were cited in a GAO Report:

- The P-3C cannot reach some of its patrol areas and still have adequate flying time left to patrol those areas. In time of war, this problem will be exacerbated as foreign airbases could be denied.
- To deal with the future threat, the aircraft needs to be able to carry larger payloads of mission avionics and ordnance in order to perform its mission effectively.
- A newer aircraft with newer technology may be less expensive to support. (Ref. 26:p 4)

The Office of the Secretary of Defense (OSD) approved the P-3G program in July 1986 and changed the name of the aircraft to the P-7 Long-Range Air ASW Capability Aircraft (LRAACA). The first production aircraft was to be delivered in March of 1993 with an estimated unit cost between $32-40 million dollars (fiscal year 1987 dollars). But due to the decreasing DOD budgets in the 90's, commonality with the P-3 declining from an anticipated 20 percent to near zero, and a one-to-two year delay required for re-design, the P-7 program was canceled in July 1990. (Ref. 26:p 5)

Throughout the service life of this aircraft, many modifications and updates have been implemented. The last model in the series, the P-3C, is currently used by U.S. Navy squadrons. Three electronic package updates were performed on the sensor and data collection equipment within the aircraft. The final update implemented in the P-3C, the Update III package, is in use for all active duty squadrons, and is the equipment that

is being integrated into the AIP program. The current fleet consists of 180 P-3s in 12 active squadrons and 8 in reserve squadrons. (Ref. 27:p 1) At the time of printing of this thesis, Rear Admiral Dennis McGinn, Chief of Naval Warfare, has initiated a study for a follow-on platform to replace the P-3 in the 2015 time-frame. The project is likely to select a commercial aircraft derivative rather than invest in a military-unique solution. (Ref. 36:p. 1). The AIP program is now in full production and units have been delivered to the Fleet Replacement Squadron (VP-30), and two operational squadrons in Hawaii, Patrol Squadron Nine (VP-9), and Patrol Squadron Four (VP-4). (Ref. 40:p. 1)

2. AIP Program

The P-3C Anti-Surface Warfare Improvement Program (AIP) was initiated during the 1994 fiscal year due to the cancellation of the P-7 and the cancellation of a P-3C Update IV program, originally proposed in October of 1992 (Ref. 29:p. 2). The program was a direct response to a fleet requirement for capabilities that were needed for the new missions being assigned to the Maritime Patrol Aviation community. This subsection will look at the program history, capabilities, funding, and current status.

The growing demand for fresh, immediate intelligence concerning international hot spots has brought renewed interest in the P-3. The aircraft is relatively simple to operate and maintain and has modest logistics needs. Maintenance personnel and aircrews of the P-3C are accustomed to far-flung deployments on short notice. Using equipment that is incorporated into the AIP program, several P-3's currently in service have become a crucial photographic reconnaissance tool for operations to monitor peacekeeping in Bosnia and to track the new crisis in Albania. In 1997 and 1998, during

14 months of operations in this area, Navy patrol squadrons flew 324 missions and looked at 2,425 targets. (Ref. 38:p. 1) Another example is Exercise Foal Eagle '97 in Korea. Air Force E-8 Joint Surveillance Target Attack Radar System (JSTARS) aircraft down-linked data to an Amphibious Squadron staff and Marine Expeditionary Unit (Special Operations Capable) (MEU[SOC]) command element in the supporting arms coordination center (SACC) on the Belleau Wood (LHA-3) which in turn directed a P-3C reconnaissance aircraft against the targets, resulting in a direct video display of enemy activity on the ground. (Ref. 27:p. 38). These capabilities are not available on a P-3C that does not have the AIP improvement package.

The objective of the AIP acquisition program was to purchase Commercial Items (CI) and/or Non-developmental Items (NDI) for installation in 50 P-3C Update III aircraft in order to provide a significant increase in the P-3C's capabilities. The program was designed to rapidly improve fleet operational capabilities at an affordable cost in the areas of Anti-Surface Warfare (ASUW), Over-the Horizon Targeting (OTH-T), Command, Control, Communications, and Intelligence (C^3I), and survivability. This was to be accomplished by building an integrated improvement "kit" that provided enhancements in sensors, communications, displays and controls, survivability and vulnerability, and weapons capability. Total life-cycle cost of each kit was estimated at approximately 1.5 million dollars for this twenty-year program. Sources of the equipment were a combination of contractor-furnished equipment (CFE) and government furnished equipment (GFE) (Ref. 28:p. 8). Key items in the AIP kit include:

- A new generation of AVX-1 roll-on-off long-range, electro-optical, daylight video cameras;
- An Inverse Synthetic Aperture Radar (APS-137B) with both a range in excess

of 100 mi. and the ability to pick out an object as small as a submarine snorkel;

- An improved infrared detecting set with double the resolution of the unit currently installed. The prime contractor has selected WESCAM, an electro-optical systems provider, to provide two systems with the option of 160 additional units; (Ref. 37:p. 1)
- An improved high-data-rate communications suite to include multiple circuits on a single satellite channel. The suite also utilizes frequency hopping Ultra-High-Frequency (UHF) to limit the effects of jamming and narrow-band satellite communications;
- The capability of firing Maverick standoff missiles;
- The addition of a chaff-and-flare survivability package. (Ref. 38:p. 2)

Lockheed Martin Tactical Defense Systems is the prime contractor for building the AIP kits. In 1996, the company was selected to provide a Cooperative Engagement Capability (CEC) advanced development system and install it on a P-3C to prove the concept. (Ref. 41:p. 1)

There are currently two programs that provide funding for the AIP program; the P-3 modernization program, and the P-3 modification program. Modernization refers to only AIP funding, whereas the modification program refers to AIP funding, Sustained Readiness Programs (SRP), and other funding needed for the P-3 Orion. As with all scarce resources, competition for these "modification" dollars is fierce, and the AIP program funding varies as the fleet needs vary from year to year (Ref. 43). In fiscal year (FY) 1998, 3.2 million dollars were budgeted for the P-3 modernization program. Congress raised this amount in a "plus-up" of 10 million dollars in the FY 1998 Defense appropriation and authorization bills. This was done to accelerate the integration of the AIP sensors into fleet aircraft. Three million dollars is budgeted for the AIP program in FY99. (Ref. 41:p. 5)

In FY 98, 164.9 million dollars were budgeted for the modification program. Authorization bills increased this funding by 50.3 million dollars to include two additional AIP kits at 8.65 million dollars each, and 34 million dollars for the SRP program and other systems. The appropriation bills approved this spending increase and added an additional 23 million dollars for more computer upgrades to the aircraft. (Ref 27:p. 37)

The AIP program is currently in production with 44 upgrade kits on order. The pilot production aircraft (PPA) was delivered to the fleet training squadron (VP-30) in January, 1998. The first production aircraft was delivered to VP-9 in March, 1998. Four aircraft entered the upgrade line in the first quarter of FY98. Currently, 6 P-3Cs are in modification, 28 AIP kits are on order, and 16 more kits are in the budget for completion in 2001/2 (Ref. 27:p 38). In an effort to provide standardized training for fleet operators using AIP aircraft, Naval Air Systems Command (NAVAIRSYSCOM) awarded a 8.9 million dollar firm-fixed price contract to Hughes Training, Incorporated, for the design and fabrication of a Partial Aircrew Coordination Trainer (AIP PACT) in July of 1998. This system should be completed by October 1998. (Ref. 39:p. 1)

B. SUPPORT STRATEGIES FOR THE AIP PROGRAM

This section will provide an overview of the support strategies used for the AIP program. Benefits and challenges of each method will be discussed, and the challenges presented to fleet operators will be outlined.

1. Planned Support Strategy

Lockheed Martin Tactical Defense Systems (LMTDS) became primary contractor for the AIP program in 1994, and was responsible for providing interim support in terms of repair facilities and spares for one year. LMTDS began a Logistic Support Analysis (LSA) in 1994, which is ongoing. Support strategies for the AIP program are divided into two types of equipment: contractor furnished equipment (CFE), and government furnished equipment (GFE). LMTDS has been the responsible party to secure spare and repair parts for CFE, while in place organic systems are used to provide support for GFE. (Ref. 41) The central command for parts support for the Navy is the Naval Inventory Control Point (NAVICP). NAVICP's job is to act as the central receiving and coordinating point for the P-3 community and LMTDS in terms of spare parts and securing transportation for those parts from the manufacturer to the affected unit.

GFE support strategies are previously existing support structures. For example, the APS-137 radar has been installed on the P-3 since the late 80's and the maintenance support and information necessary for that system already exists in the Navy Aviation and Maintenance Program (NAMP). The maintenance plans for the AIP version of the radar have been updated and sent to the navy logistics managers that are affected. This includes the APS 137 radar, and the ALE-47/AAR-46 chaff dispenser and radar warning equipment. (Ref. 41)

The initial support strategy for commercial equipment is an Operator to Original Equipment Manufacturer strategy, or O-to-OEM concept. A typical support cycle for an aircraft using this system is as follows: identification of faulty equipment is accomplished

at the operational level. NAVICP, in the case of the AIP program, acts as a holder for the part until it is sent to the primary contractor, in this case, Lockheed Martin Tactical Data Systems (LMTDS). LMTDS utilizes various existing repair contracts to fix and return the part, or ship the repair item to the original manufacturer.

2. Current Support Strategy

Current support strategy for the system is an extension of the original interim support. NAVICP has secured a warehouse in Tennessee owned by the Defense Logistics Agency (DLA) and holds all repair parts for the program there. Federal Express (FEDEX) manages the facility and provides the commercial transportation needed to get spare and repair parts to the fleet squadrons that order them. The warehouse inventory is totally visible to the NAVICP computer system, and in terms of inventory control, is treated as just another NAVICP inventory resource. Fleet squadrons generate a part requisition, and processing and delivery of that part is handled by FEDEX like other commercial items, and it is very effective.

The NAVICP/FEDEX support strategy was originally implemented as a risk mitigation technique used in response to an initial spare parts availability problem early in the program. The Navy supply system used to provide parts for organic support systems takes an average of 30 to 40 days to provide a part, from the initial request to delivery, which proved inadequate for the AIP program. The cycle time for AIP repair parts ranges from 24 hours to 3 to 5 days depending on where the affected unit is located in the world. In general, cycle times are shorter the closer the affected unit is to the commercial transportation network. Aircraft that need spare parts while forward

deployed at remote sites are experiencing a 3 to 5 day waiting period for a part if it is actually in the system.(Ref. 41)

3. Challenges and advantages of current support strategy

The aircraft ICS system and the radar system are currently having maintenance problems. Total replacement of the AIP ICS system with VP-5 in Bahrain had to be conducted for 2 systems, primarily due to faulty parts and unanticipated temperature fluctuations (aircraft are subjected to 160 degree plus heat while sitting on the ramp in Bahrain). The MTBF rates in the APS-137 radar, and the ICS system are higher than originally anticipated. The AIP program management office is in the process of purchasing a test set that will be installed at a Navy Depot maintenance facility that will provide an organic depot level capability to change out defective sub-assemblies in the APS-137 radar. The strategy is to use Raytheon corporation to repair data processing cards, instead of entire radar units. This strategy should result in cost savings for items that have high repair rates in the radar unit. (Ref 41) Part of the organic support structure for the P-3 Orion is the Naval Aviation Depot (NADEP). The NADEP currently has the capability to run a check and test on pull and replace equipment on the GFE and for some CFE in the AIP program. Many commercial items used in the AIP program have had no instances of failure. The antenna combiner unit for the satellite communications system is a good example of this. The units in place have been operable for 2 years with no calls for service or spares. (Ref. 44) Barko Corporation has been manufacturing the new data displays being used in the system. Some failures have occurred, and using the O-to-OEM strategy, turnaround time has been within 2 weeks. Normal turnaround time for several comparable units in the Navy supply system is 30 to 40 days. (Ref. 41)

Obsolescence occurs quickly in this strategy. At the time of this writing, several parts for the AIP system have already gone out of production. The decision not to adopt a total buy-out strategy was made to keep costs low and to keep the ability to insert new technology as it becomes available. A buy out strategy would keep the system at one level of technological development. There is no cost effective means to provide an organic support structure for equipment purchased with an O-to-OEM maintenance concept. This is due mainly to the lack of proprietary data, the costs of data rights, drawings, and the infrastructure necessary in an organic support structure, since they are not purchased beforehand. The data itself can be prohibitively expensive once the units are purchased. For example, to get the source data from Texas Instruments to create a technical troubleshooting guide for the APS-137 radar set is estimated at 25 million dollars. (Ref. 41)

V. CONCLUSIONS AND RECOMMENDATIONS

This chapter will provide conclusions and recommendations in providing a logistics strategy for a CI/NDI program, followed by suggestions for further study.

A. CONCLUSIONS

This thesis examined the logistics support concepts used in a Commercial Item/Non-developmental Item acquisition program. The research focused on how effective the chosen logistics strategy is in terms of planned failure rates in fleet units, and effective delivery time for spare parts when a failure actually occurs.

Primary Research Question:

- Is there an ideal method of providing logistic support for Commercial and Non-Developmental Items used in the P-3C AIP Program?

The AIP program was implemented before and during the radical change in defense acquisition, between the years of 1994 and 1996. The logistics support systems in place for CI/NDI systems in the U.S. Navy are currently undergoing change from a primarily organic, government supply system, to a flexible, demand-driven commercial support structure. There is no adequate way to determine the most advantageous logistical support system during this transition period from government support to commercial support. However, the most common factors of an effective support system for military equipment is one which is cost effective, that is responsive to the needs of fleet units, and one that provides high-quality parts and services for the life of the project.

Secondary Research Questions

- What are the advantages and disadvantages when using a CI/NDI procurement strategy?

The use of existing, previously-developed items saves research and development costs, shortens fielding time, and reduces risks associated with new development. The private sector now leads the military defense establishment in developing state-of-the-art technology. Therefore, the Department of Defense must now buy from the commercial market to obtain these products. Thus, another advantage of this strategy is the ability to provide state-of-the-art products to fleet operators in the same time frame as a normal commercial customer could obtain them. Finally, the CI/NDI procurement strategy helps to integrate the defense and commercial industrial bases. DOD requirements that are integrated into commercial production are far more likely to have a stable and existing industrial base to draw on if there is a surge in requirements due to an emergency. Also, in times of reduced procurement, DOD business is not sufficient to keep many defense-unique suppliers in business. Integrated commercial and defense production is beneficial for the nation's security and economy in the long run.

A disadvantage of the CI/NDI strategy is that the analysis required to determine the logistics support products that are needed for the system can be overlooked. Procuring and integrating logistics support products such as maintenance and training manuals, repair facilities, and spare parts inventories occurs in a shorter time frame than normal procurement strategies. Therefore, the time required to analyze all available support options decreases. This can result in a lack of support once the unit is in the field. Most likely, logistics support activities are accelerated to fit the quicker delivery

schedule for these systems, and usually become degraded in the process.

Another disadvantage is that fundamental differences between government incentives and commercial incentives may result in support strategies that do not support government goals. When contractors purchase support products under commercial buying practices, the incentive is to obtain the best value for the company, and in turn, to maximize profit. In contrast, government buying practices are geared by public law to maximize opportunity and competition, effect change through socio-ecomic provisions (awarding contracts to government-identified special interest groups), and to spend tax dollars prudently. By depending on commercial support for the life of a program, the Government might have to sacrifice some of it's goals in order to provide the needed support in the field.

- What are the primary logistic support strategies used by the Navy for a CI/NDI procurement strategy?

The primary logistic support strategy used by the Navy in a CI/NDI procurement is interim contractor support during development, and either full contractor support or an Operational to Original equipment manufacturer (O-to-OEM) support strategy. For those contracts using Government furnished equipment, existing organic support structures are used.

- What form of logistics support was contracted for at the beginning of the program and what were the advantages and disadvantages of that support strategy?

The logistics support strategy for the AIP program was full contractor support for

the interim phase of the project, which was to develop into a Naval support strategy once the program was in full production. The O-to-OEM maintenance strategy was to be used for contractor furnished equipment, and organic support was to be used for Government furnished equipment.

An advantage of using this strategy was the flexibility in using previously available support from the Navy and the original equipment manufacturers (OEM). OEMs of all the equipment in the AIP program have an incentive to provide the best support available in the initial phases of development, since competition can eliminate them for consideration. The program manager for the AIP program was able to pick and choose the best products available due to this flexibility. Another advantage was easier integration of GFE due to using available government support. The radar set , the radar warning system, and the chaff dispenser are all supported in the Navy and Air Force supply systems. Integrating the support needs of the AIP system was relatively easy.

Using this support strategy shifted the emphasis on fielding the equipment purchased for the AIP system, instead of fielding a "weapons system". The lead times needed to buy and manufacture spare parts, and to field support equipment was decreased, and as a result AIP kits were put into the fleet without parts available for them if failures occurred. This has resulted in the logistics program manager competing with the production line for spare parts.

For commercial items, there was inadequate logistics data from the beginning of the program. In most cases, logistics data describing the support structures necessary and the failure rates for individual equipment did not exist. As well, the particular

environment used in the P-3 Orion is different from the other environments that the equipment was initially designed for. Since the timeline for production was accelerated, the time needed to generate data from the PPA wasn't adequate to accurately assess all the different modes of operation. (Ref 41)

The criticality analysis or the failure/modes analysis that is usually accomplished in the beginning of a program was eliminated as a cost saving measure for the AIP program. The logic at the time was that the CI/NDI items could not be changed, since they were already designed, and therefore would not affect the design variables of the system. This analysis is the starting point for designing and implementing a logistics support program for most weapon systems. Eliminating it resulted in a lot of guesswork by the program logistics team, deciding what tasks and modes to provide maintenance tasks and parts for. Without the benefit of this analysis, the process to design a support structure may miss some variables for repair parts. A good example of this difficulty is the establishment of manual fault isolation tasks. Development for a program of this size usually results in 900 to 1400 tasks being generated, if a criticality analysis is done. The AMPL staff generated only about 40 to 100 tasks. Therefore, the cost savings realized by using CI/NDI could be reduced by the additional cost of identifying and correcting the support structure and the equipment only when fleet personnel detected a problem, instead of at the beginning of the program. (Ref 41)

- What form of logistics support is currently provided for the P-3C Orion AIP program?

Currently, the AIP program is supported by NAVICP and its warehousing of all available spare parts at a premium transportation central warehouse in Tennessee. This

warehouse is owned by the Defense Logistics Agency (DLA) and managed by Federal Express. Parts are requisitioned by fleet squadrons and delivered via the FEDEX transportation system. The inventory is fully visible to the NAVICP database and is treated as a normal inventory holding point for high demand items for the AIP program. Using FEDEX as the primary transportation system results in a marked decrease in cycle time from three weeks to three to five days.

- What ways are available to improve the effectiveness of logistic support for CI/NDI programs similar to the P-3C Orion AIP program?

CI/NDI programs have very short logistics planning cycles, since the first three phases of a normal acquisition are combined into one Milestone. Early identification of the logistics strategy is critical for these programs. The failure rates specified for the equipment purchased in CI/NDI programs must be reliable. Holding contractors responsible for achieving established failure rates must be an integral part of the contracting process.

During the initial planning stages of a CI/NDI procurement is the best time to decide the support strategy for the life of the project. It is usually not cost-effective to design a completely organic support structure for CI/NDI systems. The time and costs associated with developing organic support structures usually exceed the life-cycle cost of buying replacement parts when needed. (Ref. 44.) Advances in technology continue to occur rapidly, and system upgrades occur within a few years after the initial purchase. Expected service lives of many CI/NDI systems are measured in two to four years, not the 10 to 20 years like many military weapon systems.

Support strategies that use non-traditional methods, such as extended warranties,

disposal on failure, etc, might be the most cost-effective method to provide support to the system. Also, proven NDI/CI systems have reliable failure rate data, allowing for more accurate planning in terms of inventory purchase. CI maintenance manuals and drawings are limited in their ability to troubleshoot and repair items beyond "plug and replace" maintenance concepts. Additional data concerning technical specifications for CIs usually involve proprietary data, for which the manufacturer usually demands an inordinate sum of money.

The risk of unavailable support in times of conflict is a very real concern for military logistics planners that use contractor support. Despite contractual agreements between a commercial entity and the government, companies may open themselves up to subversion and attack if eliminating that company could reduce the combat effectiveness of U.S. fighting forces. Spare parts and maintenance support for advance units could evaporate if companies that provide support to combat units are targeted by the enemy. For example, terrorist attacks on FEDEX employees and assets could eliminate that company as a method of combat support. Companies are global in scope, and expecting them to become patriotic in a unpopular mission could result in military personnel being put at risk.

B. RECOMMENDATIONS

- Hold contractors accountable. Established failure rates and services that are specified in contractual agreements should be rock solid, and failure to hold those standards should be dealt with swiftly and effectively. Establishing a precedent in contractual disputes that demonstrates the governments resolve to get what it pays for

could help in keeping contractors honest in terms of representing their products accurately.

- Putting personnel with current fleet experience on logistics support teams should also be a priority. The user perspective during the logistic planning process would prove invaluable when organizing the system necessary to provide the operators with the right equipment at the right time.

- Supportability analysis should begin as soon as possible to identify the support strategy once a commercial or non-developmental system is chosen. One of the most important challenges to be met when establishing logistics support for CI/NDI items is adapting the existing support structure and data to the new mission or use of the equipment. For example, the ALE-47 chaff dispenser has the same operational mission on the P-3 as it does on the F-18, but the airspeeds, missions, and operational environment of the two aircraft are very different, and thus may affect the logistic support of that item.

- Ensure support strategies address the issue of obsolescence and that, if no proprietary data is available for parts and items, many manufacturers are available and are easily replaceable.

- Rather than acquiring CI equipment and support capability on separate contracts, it is beneficial to acquire them together.

- Specifying the support strategy early-on in the procurement process, and then specifying the exact nature of the support in the equipment purchase contract (number of

spare parts, procedures for replacement and repair, not-later-than dates, replacement guarantees according to location, etc.), usually result in the most effective contractor support. Replacement of the ICS system in Bahrain for VP-5 is a good example of this support strategy. Using commercial standards can also help in maintaining the ability to upgrade and adapt to changing technology.

- "Disposable" support strategies be adopted for "disposable" systems. As anyone with a laptop computer can attest, some advanced systems will decrease dramatically in value as newer technology is introduced, making the system obsolete and costly to support. In the long run, procuring support systems that are designed to operate for the life of the equipment, and be discontinued with the system, make more fiscal sense than continuing to spend dollars on the system to justify the initial expense.

C. AREAS FOR FURTHER STUDY

The following issues were raised during the research and are recommended for further study:

1. What are the risks associated with decreasing inventory levels and more reliance on full contractor support in a CI/NDI acquisition? There is a definite security issue in depending on non-military organizations for critical spares and maintenance for combat systems. What are the security concerns when contracting for the proper amount of spare and services? Companies in the global marketplace will not necessarily act in the best interests of the United States, and depending on these companies to do so due to contractual obligations could lead to inadequate logistics support in times of crisis.

2. Does the added benefit of quick fielding time and lower cost outweigh the logistics support concerns and vulnerability issues for a weapon system? Once a statistically significant amount of failure data is generated for the AIP program, a cost benefit analysis that includes the risks and vulnerabilities associated with non-organic support should be conducted.

3. What effect does the lack of standardization have on the logistics support of weapon systems? Are commercial standards adequate for military use?

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